and the rms integral of the latter spectrum $\bar{u}_{xa} \simeq 0.04U_\infty$. The roll-off points are related by $S_U = S_p/2 = 1/2\pi$. These spectra of "quasi-isotropic" turbulence whose ms values satisfy Batchelor's relation $\bar{p^2} = 0.34\rho^2(\bar{u_a^2})^2$ with density ρ, predict, in accord with experiments, a rather uniform level at low frequencies and a slope of -9 and -6 db per octave, respectively, at high frequencies.

*Sponsored by the Applied Physics Laboratory of The Johns Hopkins University.

DB12 Measurements of Temperature and Velocity Fluctuations with Two Constant-Temperature Hot-Wire Anemometers H. TENNEKES and P. K. McCALL, Penn State Univ. at Univ. Park - Even the smallest feasible resistance thermometers have a very limited frequency response. If a bandwidth up to 10 kHz is desired, a method of measuring temperature fluctuations suggested by S. Corrsin seems preferable. With two constant-temperature hot-wire anemometers operated at widely different temperatures (say, 50 and 250°C above ambient), a simple linear analog circuit can decompose the two signals into velocity and temperature fluctuations if the fluctuation levels are small. The design, adjustment, calibration and sensitivity of this instrument are described and results of preliminary measurements in the atmospheric boundary layer are given.

* Work supported by the Atmospheric Sciences Section, National Science Foundation, under Grant NSF GA-18109.

DB13 Some Characteristics of Platinum Wire Temperature Probes.* JOHN LA RUE and CARL FRIEHE, U. Calif., San Diego--The temperature coefficient of resistance, the frequency response, and the velocity sensitivity of small diameter platinum wires used for the measurement of fluctuating temperature in turbulent air flows are determined. The measurement of absolute temperature depends on the temperature coefficient of resistance which is found to be 25% less than the handbook value. The frequency response has been determined in a velocity range of 0 to 8 m/sec for 0.25μ and 0.62μ diameter wires. These measurements are expected to apply to long wires of the same diameters and are compared to previous measurements. Finally, the velocity-sensitivity, which Wyngaard[1] indicates can lead to significant errors in certain temperature statistics--even at low heating currents--has been measured.

* Submitted by Paul A. Libby

1 Wyngaard, J., 1971, J. Fluid Mech, 48, 763.

DB14 Anisotropy of Microscopic Fluctuations of an Oil Drop in Gas at Rest.*- R. J. EMRICH and Y. W. KIM, Lehigh University. - Poor agreement of measured brownian-sized fluctuations with the theory of brownian motion has been known for many years[1,2]. In particular, more vigorous fluctuations in horizontal than in vertical directions, or vice-versa, have been seen and reported. Since the thorough work of Fletcher[3], who took great pains to reduce convection and obtained agreement with theory, there has been good reason to attribute anisotropy to residual convection effects. Even though the gas is in a constant temperature closed space and the convective velocities are extremely small, we find statistically significant (95% confidence) anisotropy in more than half of data samples, each consisting of over 800 position measurements at successive 5 millisecond intervals. The fluctuations are gaussian-distributed and their mean squares are quite linearly dependent on the time interval. We feel that these are residual effects of decaying turbulence representing a non-equilibrium state.

*Partially supported by NSF.
1. Fürth, R., Ann. der Physik 59, 409 (1919)
2. Elrick, R. M., Phys. Fluids 12, 243 (1969)
3. Fletcher, H., Phys. Rev. 33, 81 (1911)

DB15 Velocity Measurements with a New Probe in Inhomogeneous Turbulent Jets.* I. H. TOMBACH[+] and D. COLES, California Institute of Technology.-- A velocity measuring probe, which creates "spots" of heat in a fluid flow by means of a pulsed heated wire and then senses the rate at which they are convected past a sensing wire, has been used to measure velocity profiles in subsonic, inhomogeneous, axisymmetric turbulent jets. In such flows the detected thermal profile of a spot is highly distorted, but reconstruction of a mean profile, by digital computer, from several hundred spots enables calculation of a mean velocity and a turbulence level. The measurements indicate that a jet which is less dense than the quiescent ambient fluid mixes with it more vigorously than a similar ambient density jet with the same nozzle Reynolds number. This is manifested by the higher turbulence levels, more rapid growth, and faster decay of the mean velocity of the less dense jet compared to the homogeneous one. A jet of denser-than-ambient fluid demonstrates the opposite behavior.

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+Now at Meteorology Research, Inc., Altadena, Calif.

DB16 Static Calibration Errors in Constant-Temperature Hot-Wire Anemometers*† K.N. HELLAND, U. Calif., San Diego-A recent investigation[1] has reported large errors in the calibration of constant-temperature hot-wire anemometers. An experiment was performed to see if a DISA 55A01 anemometer operated with a DISA 55D10 linearizer is subject to errors when calibrated statically. A standard Thermo-Systems, Inc. tungsten wire was mounted on a shaker apparatus whose motion was continuously monitored by a position transducer. The linearizer was adjusted to give a static linear hot-wire calibration with the shaker off. The hot-wire was then vibrated sinusoidally in the longitudinal direction at a constant amplitude and frequency so that the root-mean-square speed of the shaker was constant. The measured hot-wire root-mean-square speed, u', fell monotonically as the mean wind tunnel speed, U, was increased from 3 to 10 m/sec where u' was 10% below its value at U = 3 m/sec. It appears that a static calibration can lead to large errors in the measurement of fluctuating velocities.

*Submitted by C. W. VAN ATTA
+Work supported by NSF
1. Perry and Morrison, J. Fluid Mech. 47, 765 (1971).